

107
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ACUTE ANTERIOR POLIO-MYELITIS

(ACUTE SPINAL PARALYSIS)

IN ADULTS.

BY

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ASSISTANT-PHYSICIAN TO THE ROYAL FREE HOSPITAL.

[Reprinted from the BRITISH MEDICAL JOURNAL of June 7th and 14th, 1879.]



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THREE CASES OF ACUTE ANTERIOR POLIO- MYELITIS (ACUTE SPINAL PARALYSIS) IN ADULTS.

ONE of the commonest diseases of the spinal cord, and one which has received, perhaps, more study than any other at the hands of physicians and pathologists, is the condition which is familiar to all practitioners under the name of "infantile paralysis". Yet, although it is frequently met with, and although in its clinical aspects it is well defined, and in the greater number of cases easily distinguished from all other diseases, it is not many years since the first careful description of the disease was written, and it is still more recently that its pathology has been understood. A few isolated cases seem to have been put on record in the latter half of the last, and in the early decades of the present century; but it was not until 1840 that the disease came to be recognised as a distinct clinical entity. In that year, a careful account of it was written by von Heine, who called it "spinal infantile paralysis". He confined himself, however, to giving an accurate description of its clinical features, leaving its pathology to be explained by others. The pathology remained unexplained for nearly a quarter of a century; for it was not until 1863 that Cornil first recognised a morbid condition of the spinal cord in cases of this kind. Cornil was unable to arrive at any satisfactory conclusion regarding the localisation and nature of the lesion; but in 1865, Prévost and Vulpian stated that the morbid changes were principally confined to the anterior horns of grey matter, a statement which was before long confirmed by Lockhart Clarke, Charcot, and others, and which has now taken its place as one of the most certain facts in pathology. There has been some little difference of opinion as to the exact nature of these changes, some believing that the primary condition is an acute inflammation of the true nervous tissue; others that the interstitial connective tissue of the cord is the starting point of the morbid process. But however that may be—and the question must at present be left an open one—the disease may be looked upon as due to an acute inflammation of the anterior horns of grey matter, either confined entirely to these horns, or diffusing itself more or less widely in their neighbourhood. The inflammation may resolve entirely; or, as is far more commonly the case, it

may produce more or less damage to the organ of a permanent nature, destroying the softer, more delicate tissues—namely, the nerve-cells and nerve-fibres, and producing overgrowth of the harder less delicate interstitial connective tissue. As the result of these changes, we have the phenomena of “infantile paralysis”.

It was for some years thought that this disease was one peculiar to young children, a belief which originated in the fact that it occurs very much more frequently in them than in adults, and which has been fostered and encouraged by the designation by which it is almost universally known. One of the results of the immense advance which has been made in the last few years in our knowledge of nervous diseases, has been to show that “infantile paralysis” is by no means confined to children, but that it is met with, though less frequently, at almost any period of life. It is often the case with discoveries, that the merit of having been the first to make them is disputed by two or more observers. The discovery is not made by a sudden leap, but is gradually led up to by a succession of advances; and as several men are working in the vein thus opened up, it frequently happens that two or more workers reach the goal about the same time, but quite independently of one another. So here, the merit of having been the first to describe cases of spinal disease in adults, which resembled in all points the condition known as “infantile paralysis”, is claimed in France for Duchenne de Boulogne, and in Germany for Moritz Meyer. As a matter of chronological fact, it would appear that Meyer was the first to publish cases of this kind, but that the first detailed description which showed the position which such cases should hold among diseases of the spinal cord was given by Duchenne shortly afterwards. Since that time, cases have been reported in France by Chareot and one or two other physicians; in Germany by Bernhardt, Kussmaul, Erb, Weiss, etc.; in America by Seguin; but in this country, so far as I am aware, the only cases published have been by Dr. Althaus, in a paper which he read last year before the Medical Society of London, and which he has since published;* a case described by Dr. Glynn of Liverpool, in a lecture which he published in the *Lancet* for September 21st, 1878; and a case in a lad of 14, described by Dr. Octavius Sturges in the *Lancet* for January 4th and May 3rd, 1879.

In consequence of the discovery that the disease is not confined to young children, the name “infantile paralysis” has lost its force; and as it has now been settled beyond dispute what is the pathological basis of the disease, an endeavour should be made to supply in its place a more strictly scientific name, one which shall in itself indicate the true nature of the disorder. It is not very easy to designate in two or three words a condition such as that which forms the pathological basis of this disease; and hitherto nothing better has been devised for the purpose than the somewhat uncouth name with which I have headed this

* *On Infantile Paralysis and some Allied Diseases of the Spinal Cord.* By Julius Althaus, M.D., M.R.C.P.

paper, namely, "acute anterior polio-myelitis" (πολιδς = grey), for which we are indebted to Professor Kussmaul. The name has been adopted by Professor Erb in the recently published volume of Ziemssen's *Cyclopædia*, on Diseases of the Spinal Cord; and in this country, Dr. Althaus has described the disease under this name in the little work just referred to. It would seem, therefore, that the name is one which is likely to be permanently adopted.

It will be scarcely necessary to recapitulate the symptoms in an ordinary case of infantile paralysis; the feverish attack, with perhaps pain in the back and limbs, followed within a few hours or a few days by very rapid onset of paralysis in one or more limbs, the paralysis being associated with absolute muscular flaccidity, but usually unaccompanied by any marked modification of sensation; the more or less complete recovery of certain groups of muscles, others being left permanently damaged; the rapid wasting of the damaged muscles; and the presence of the now well-known "degeneration reaction" in them, *i.e.*, loss of irritability to the induced current, whether applied to the muscle itself, or to the nerve supplying the muscle, loss of irritability to the constant current when applied over the nerve, and increase of irritability to the constant current when applied over the muscle, this latter property disappearing after the paralysis has lasted a certain length of time. Last of all, the resulting deformities in the member—imperfect development of the limb; contraction of unopposed muscles, producing club-foot, etc.; dangling flail-like joints, and other well-known and frequently occurring conditions. Cases may present every degree of intensity, from the child who is unable to move a muscle in any one of its limbs, to the case in which one or two muscles only of one limb are partially paralysed and wasted. The cases most frequently met with, however, are those in which one or more groups of muscles of one limb are affected in varying degrees, leaving certain other groups in the same member nearly or wholly free from disease; and it is these cases which superficially present the greatest contrast to those forms of paraplegia resulting from myelitis of wider range, in which both limbs are almost always affected, and in which all the different groups of muscles present about the same degree of weakness.

Most of the cases described by Professor Charcot, both of those recorded by Dr. Althaus, and also the cases described by Dr. Glynn and by Dr. Octavius Sturges, of the disease as it occurs in the adult, correspond to the more severe degrees of infantile paralysis, several of the limbs being affected to a very marked extent. The three cases which I am about to describe, on the other hand, closely resemble those slighter and more common forms of the disease in which a single group of muscles in one limb is affected, the muscles being weakened and wasted; or where, even though several groups of muscles are involved, the amount of damage varies in the different groups.

CASE I.—F. P., a Pole, aged 44. His father died, aged 56, of a

tumour in the larynx, which the doctor said was "cheesy". There was no history of neuroses, tubercle, or gout in the family. The patient was married, with six children; he was a merchant in good circumstances till nine years before this illness. Since then, owing to failure in business, he had worked in zinc; he had never worked in lead at any time. His previous health was always excellent, until within three years of his present attack. There was no history of syphilis. For the last three years, he had been living very poorly in consequence of his reduced circumstances. There was a history of an abdominal attack which came on about a year before the present illness. He was seized with vomiting, diarrhoea, and severe pain in the left side of the abdomen. The pain lasted for several months, but the diarrhoea was replaced by constipation. He was treated for nine weeks as an in-patient at the German Hospital, and was very much relieved. The present illness began in September 1874. Except for the slight remains of the illness just described, he had been in fair health, from time to time suffering from slight pain in one knee. One morning, after walking to the railway station in the rain and getting damp, he sat down to wait half an hour for a train. Both at the station and afterwards in his workshop, he sat in a draught. In the afternoon, he felt pain in both shoulders. That night he woke up from his sleep with "horrible pain" in the shoulders. The shoulders were very stiff, and he was in a profuse perspiration. Next day, he was taken to the German Hospital, where he was admitted an in-patient, under the care of Dr. Hermann Weber. The pain and stiffness soon extended down the arm, but were worse on the right side than the left, the right arm becoming "perfectly useless", but with the left he could still carry a cup of coffee to his lips. The pain was very acute, and was increased by movement of the limbs; it did not seem seated in the joints, but rather in the fleshy part of the arms, and in the forearms was worse two or three inches above the wrists. There was no particular pain in the fingers. He believed there was slight swelling of the finger-joints, but he did not recollect swelling of any of the other joints. At the end of a fortnight, he began to have pain and stiffness in the knees, ankles, and feet; but these were never so severe as in the arms. He was three weeks in bed, by the end of which time all his limbs were considerably better. He was beginning to be able to walk about, and to do things for himself, but there was still acute pain in the right forearm when the muscles were put on the stretch; consequently his arm was carried in a sling. During the whole time he was in bed, he sweated profusely. He said his temperature was taken regularly, and that it was never so high as 100 deg. Fahr.; he was told, moreover, that there was very little fever. At no time did he complain of pain in the back, or any sense of constriction round the chest, waist, or elsewhere. His bladder was unaffected.

After he began to get better, he noticed that the muscles of the legs, arms, and trunk had become smaller than before his illness; he was very much thinner altogether, and he attributed the shrinking of his

muscles entirely to this fact. He was in hospital for seven weeks, and, when discharged, was able to walk moderate distances without limping, and to use the left arm well; the right arm was, however, still stiff, weak, and painful when moved.

A fortnight after leaving hospital, he had a rigor one morning, which came on without apparent cause; he had not been exposed to cold in any way. The rigor ushered in a severe illness, in which for a week he was delirious. He cannot give many details of this illness, but he says he was in bed for a fortnight; that he was free from pain, but was so weak that he was scarcely able to move himself in bed; that he had to be fed every two hours night and day; and that towards the end of the fortnight he began to cough, and had a great deal of expectoration, whether bloody or not he cannot say. The cough lasted on and off for some months; but for some time past he had been free from it.

Since his previous illness, the muscles of the arms had never properly recovered their strength; the left had been gradually improving; he thought, moreover, that latterly the right arm had been growing stronger, and it had now quite lost the pain and tenderness which were present in the biceps and muscles of the forearm for some time after the acute illness had passed off. The weakness had, however, been sufficient to prevent him from following his trade. He had had a little weakness in the left leg, which seemed to him to lie chiefly in the muscles on the front of the thigh. This had not prevented him from walking fairly well, and latterly he had been able to walk three or four hours at a stretch.

Since his illness, he had noticed that the skin of the front of the right forearm was less sensitive than that of the corresponding part on the left side. When pressed firmly or pinched, it felt as though it were being pricked. There was also a numb patch of skin, about the size of the palm of the hand, on the front and outer aspect of the left thigh, a little above the knee. He said he had noticed this for about six years, but that the numbness had been more marked since his illness. There was no other affection of sensation, either in his arms or legs.

The patient was admitted as an out-patient at the National Hospital for Paralysis and Epilepsy in Queen Square in July 1875, under the care of Dr. Hughlings Jackson. He was very anæmic, and he looked old for his age; his hair was quite grey; arcus senilis was moderately marked; there was commencing rigidity of radials. His general health was fairly good in other ways.

Condition of Muscles.—The trapezii and sternomastoidei were symmetrical on the two sides. The action of shrugging his shoulders was well performed, and equally so on both sides.

Upper Extremities.—The right deltoid was more flabby than the left, and it had much less power of resistance to forcible movement than the left deltoid; the latter muscle appeared to be healthy. The biceps was flabby and much diminished on the right side. When the arm was ex-

tended against his will, the biceps offered only slight resistance. The left biceps appeared to be healthy. The triceps was somewhat weak on the right side, but in a much less degree than the biceps. There was decided weakness of the muscles both on the front and on the back of the right forearm; the left appearing to be healthy. The dynamometer indicated a pressure of forty-three *kilogrammes* with the left hand, but of only thirty-two with the right. The middle of the arm measured ten inches and three-eighths on the right side, and ten inches and three-fourths on the left; the greatest circumference of the forearm appeared to be rather greater on the right than the left side—the usual condition in health. There was no noticeable weakness or wasting in the small muscles of the thumb, and the interossei appeared to act equally well in the two hands.

Electric Reaction. A. Induced Current.—There was a very distinct loss of reaction in the right deltoid; the difference in irritability between the right and the left muscle being represented by a difference of three divisions on the bar of the instrument (Stöhrer's). The irritability of the right biceps muscle had almost disappeared, a very strong current producing only a slight flickering contraction in the muscle; the irritability in the right triceps had slightly diminished as compared with the left. The brachialis anticus was scarcely at all affected, and it was almost wholly with this muscle and the supinator longus that he flexed his elbow. There was slight loss of irritability in most of the extensor muscles on the back of the forearm, but scarcely any loss in the flexors on the front of the forearm. The short muscles of the thumb acted equally well on the two sides; but the interossei of the right hand were very distinctly less irritable than those of the left hand.

B. Voltaic Electricity (rheophores over muscles; Stöhrer's battery; slow interruptions; contractions produced on closing the circuit).—There was very little difference between the two deltoids, but the right appeared a little more irritable than the left, contracting first with a current from twelve cells, the left contracting with a current from fourteen cells. The right biceps did not contract even when the current from thirty cells was applied; the left biceps reacted to twelve cells. Both triceps muscles reacted to twelve cells. The flexors of the right forearm reacted to twelve cells; those of the left to fourteen cells. The extensors of the right forearm reacted to eighteen cells; those of the left to twenty cells.

Some of the muscles attached to the right scapula were affected. There was evidently some weakness of the serratus magnus, for the posterior border of the scapula stood out much further from the back on the right side than on the left. This difference was brought into greater prominence when he held his arm straight out in front of him. The angle of the scapula did not become so completely separated from the muscles of the back as when the serratus magnus was completely paralysed, but its position was an approach to that condition. There was very marked deficiency in reaction to the induced current in the muscle on the right

side, amounting, as compared with that of the left, to six divisions in the bar. There was also a marked diminution in reaction to the constant current. The right rhomboidei muscles were also somewhat wasted, and their irritability to the induced current was very distinctly less than on the left side, the difference amounting to two degrees on the bar. The latissimus dorsi and the pectoral muscles were not affected in any way. There was apparently nothing now amiss with the legs.

The patient was ordered to have voltaic electricity applied over the affected muscles (labile current), and under its influence there was considerable improvement. The biceps was too far gone for recovery, and there was no change in the serratus magnus or the rhomboidei. He became, however, so much stronger in the arm, after three or four months' treatment, that he was able to resume his work.

CASE II. — E. W., a young woman aged 20, single, living in the country under good conditions, had always had good general health before the present illness. There was no suspicion of syphilis, and no neurotic history in the family. The present illness came on in September 1876. She had been in good health, when one evening, without any history of exposure to cold or other exciting causes, she felt as though she had "cricked" her neck; there was a little pain in the back of the neck, and the neck was very stiff. She felt the same pain and stiffness on getting up next morning, and in the course of the day a bad headache came on with a feeling of sickness. That evening the left hand shook a good deal when she was using it. The following night, she woke up and found that the left arm was entirely powerless. She felt weak and poorly in herself, but there was no pain or any affection of sensation in the arm or hand. She felt ill for four days, when severe sickness came on, and she vomited repeatedly for a whole week. At the end of this time, her general health improved considerably, but the left arm continued quite powerless, and she had at times pain across the shoulders which she compared to rheumatic pains. There was at no time any sensation of tightness round the neck or chest. From the first onset of the weakness, all the muscles of the affected arm were quite flaccid. Three or four weeks after the commencement of the illness, the patient herself noticed that the muscles about the shoulder were wasting; and shortly afterwards the muscles of the arm and hand were likewise found to be markedly smaller than on the healthy side. At the end of three months, the wasting was very great. At that time, she was prescribed a course of arsenic, and considerably improved under the treatment. She was admitted into the National Hospital for Paralysis and Epilepsy in February 1878, under the care of Dr. Radcliffe, to whom I am indebted for permission to publish the case.

At the time of her admission, there was very marked wasting of all the muscles of the left arm; the deltoid was almost absent, the shoulder being flattened, and the point sharp. The arm round the middle of the biceps measured only eight inches and a quarter in circumference; the right arm measuring nine inches and five-eighths. The power in the

deltoid was quite gone, as she could not remove her arm from her side. She was able, however, to bend the elbow fully, but her power of resisting forcible extension of the joint was very small. There seemed to be no power whatever in the triceps, which had almost completely disappeared.

The muscles of the forearm, both flexors and extensors, were very much wasted, the greatest circumference of the limb below the elbow being eight inches and a quarter, as opposed to nine inches and a half on the right side. The hand was in the "main-en-griffe" position, typical of wasting of the interossei and lumbricales; the tendons of the flexor muscles were sharply defined under the skin of the palm, and the metacarpal spaces were sharply defined on the back of the hand. The thenar and hypothenar eminences had almost completely disappeared. The patient was able to flex her wrist fairly well, though with only slight power of resistance. She had great difficulty in producing extension of the joint. She could squeeze a little with her fist, but could not bend the first and third phalanges, nor extend the second phalanx of the fingers. She could hold a fork in the hand, but could not make use of it. Sensation appeared to be wholly unaffected.

Examined electrically, the muscles presented the reaction usually found in old cases of acute atrophic paralysis, namely, more or less complete loss of reaction to the induced current, complete loss of reaction to voltaic electricity applied over the nerves, and marked diminution to the voltaic current applied over the muscles. I need scarcely repeat what I have already said, that this last peculiarity is only found in the later stages of this malady, and that in the early stages there is almost invariably an increase of irritability in the affected muscles to voltaic electricity when the poles are applied over the muscles themselves.

Her general health was good, and none of the other limbs were affected in any way. There was likewise no affection of the serratus magnus, rhomboidei, or pectoral muscles on the left side. Under treatment, which consisted mainly of tonics, voltaic electricity to the affected limb, and the use of Junod's boot to increase the circulation in the arm, there was some little improvement; the metacarpal spaces became somewhat more filled up; she was able to extend the wrist considerably better; and she regained the power of doing many little things which were impossible to her when she first came into hospital.

CASE III is that of a girl aged 19, single. She had generally lived at home in the country under fairly good circumstances; but for some little time before the onset of the present illness she had been acting as shopwoman in a confectioner's shop, where she was a good deal exposed to draught. There is no other history of exposure to cold or wet. The family history was good, her father and mother and ten brothers and sisters all being alive and in good health. The patient was never very strong, and since the establishment of the menstrual function, about four years before her present illness, she had been subject to

palpitation and general weakness. There was no suspicion of syphilis. Her present illness began in July 1877. The first thing which attracted her attention was that her legs pained her a good deal, the pain being worst in the calves. The pain was aching in character, not shooting or burning, and worse by day than by night; it was not sufficiently severe to prevent her from keeping at her work. Two or three days after the first onset of this pain, she felt a sort of itching or irritation in the legs, and there was a feeling as though a strap were bound very tightly round the legs above the knees. About two o'clock the next morning, she woke up with a severe dull aching pain in the small of the back; and on that day she had severe pains all over her. She was very hot and "nervous", and the doctor who was called in said that she was delirious. Two days afterwards, she found that she had completely lost power in her right leg; but the other limbs became very much better. She believes that she was feverish and delirious for about a fortnight altogether. There was no sensation of tightness round the waist, no affection of ordinary sensation, and no difficulty with the bladder throughout her illness.

About three weeks after the first onset of her illness, she experienced a very sharp pain in the right leg. The pain was still seated in the calf of the leg, but it was now very sharp, as though something were being cut out of it. The pain was so severe as at times to make her cry out. It lasted for about a week or ten days. It was relieved by lying down, and worse when she sat up.

She remained very ill for two months, but at the end of that time she began to improve in her general health, the right leg, however, still remaining quite helpless. About four or five months after the first onset, the power began to return; and since that time she continued to gain a little power in the limb.

She did not notice any difference in the size of the limbs until about six months after the onset of her illness; but, as she found at that time there was a very marked difference in the size of the limbs, it is probable that the wasting of the right leg had come on some time before without her being aware of it. From the first, she has noticed that the right leg has been colder than the left, both in its own feeling and also when tested with her hand.

The patient came under my care at the Royal Infirmary for Children and Women in May 1878. She was a fairly well nourished but somewhat anæmic girl. The right leg was so weak that she was scarcely able to bear any weight upon it, the left leg being quite healthy. The weakness involved the psoas and iliacus, for she was able to resist forcible extension of the hip-joint with much less force on the right than the left side. There was, however, sufficient power left in them to enable her to raise the foot six inches off the ground. All the muscles of the thigh were more or less weakened—much more so than the psoas and iliacus. The muscles of the calf were quite powerless; but the extensor muscles of the toes and the tibialis anticus retained a certain

amount of power, for she could flex the ankle and extend the toes fairly well, and could offer a slight resistance against forcible extension of the ankle-joint. The peronei muscles were quite powerless.

There was very marked wasting of the right leg. The circumference of the middle of the thigh was, on the right side, only fifteen inches and three-quarters; on the left side, seventeen inches and five-eighths. The greatest circumference of the calf was, on the right side, eleven inches and a half; on the left, thirteen inches and a half. The muscles of the right leg were very flabby, and the limb felt much colder to the touch than the left leg. There was very decided flattening of the right buttock, and the fold formed by the gluteus maximus was less deep, and descended lower on the right than to the left side.

The wasted muscles presented the typical reaction found in old cases of infantile paralysis, viz., diminution or loss of reaction to both currents, both when applied over the muscles themselves and through the nerves. In the calf muscles and in the peronei, in which power was completely gone, there was no reaction to either current. There was a slight reaction in the rectus femoris to a strong faradic current, but none to a strong galvanic current; whilst in the extensors of the toes, though there was distinct diminution in reaction to both currents, the reaction was very much more considerable than in the muscles already mentioned.

There was no affection of sensation.

The patient was prescribed tonics and cod-liver oil, and the constant current was ordered to be applied to the leg every day (labile application of the current as strong as she could comfortably bear it). After about three months' treatment, the patient was discharged without improvement.